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ABSTRACT

Beginning with a brief history of the synergistic relationship between technology and literacy, this article examines the need for redefining literacy beyond print-based communications. It suggests that literacy, in a computer-networked society, is not solely about reading the printed word, but rather, that it encompasses receiving and sending messages in a hypermedia format. It is noted that electronic communication not only includes printed text, but may also encompass pictorials, film grammars, and multi-sensory structures requiring semiological analysis. Discussion then moves to the characteristics of hypermedia, the hypertext network, and fundamental differences between types of hyperlinks. Key literacy codes inherent in electronic hypermedia text are compared with those fostered by print-based text. The article calls for continual examination of emerging hypermedia communications in order to establish the conventions of electronic literacy. (Contains 29 references.) (AEF)

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Hypermedia: New Dimensions of Literacy

by Mary L. McNabb

Abstract

Changes in literacy codes and conventions due to hypermedia technology are discussed. Starting with a brief history of the synergistic relationship between technology and literacy, the article examines the need for redefining literacy beyond print-based communications. Key literacy codes inherent in electronic hypermedia text are compared with those fostered by printed-based text. These codes have emerged from hypertext's associative narratives, film grammars, and pictorials. The article calls for continual examination of emerging hypermedia communications in order to establish the conventions of electronic literacy.

Technology's Influence on Literacy

History tells the story of a synergistic relationship between technology and literacy. For the past five centuries, the technology of the printing press has defined the organization and presentation of communication (Bolter, 1992, p. 20). The printing press spawned a genre of written communication found in books which is predominantly characterized by linear narratives that provide transitional passages from one related idea to another. These transitions typically explain the author's rationale behind connecting ideas. Print-based writers are taught to provide readers with a coherent line of reasoning embodied in grammatical sentence structures and paragraphs connected by explicit transitional expressions. Print-based readers are taught to look for the author's thesis or main idea and to comprehend supporting points connected to the thesis in a coherently flowing narrative.

The narrative evolved and flourished for hundreds of years within cultures where print-based linear communication dominated. The written word came to dominate communication in educational realms as well as in communities because "the text was the first cheap, mass produced form of knowledge representation we had: it is called printing, and it made a revolution" (McCorduck, 1992, p. 246). Those of us who learned to be literate in a culture where printed text dominated communication have "learned to process reality in terms of a logically ordered, continuous and linear world" (Gumpert & Cathcart, 1985, p. 24). *The Literacy Dictionary* (1995) currently defines literacy as "active, autonomous engagement with print and stresses the role of the individual in generating as well as receiving and assigning independent interpretations to messages" (Venezky, 1995, p. 142). In this paper, I suggest that literacy, in a computer-networked society, is not solely about reading the printed word. Rather it encompasses receiving and sending messages in a hypermedia format.

Barnhart (1991), in a synopsis of the history of human communication systems, describes how documented or written forms of human communication started with pictures and evolved, passing through the phonography-word syllabic and phonography-syllabic to the present print-based phonography-alphabetic communication system (p. 3). In the modern print-based system of communication, the writing and the reading of phonography-alphabetic forms of communication proliferated. Barnhart (1991) suggests that the alphabetic systems of modern printed-based cultures serve the aim of human communication *better* than the preceding ones, by reducing the use of visual symbols and long-term memory space (p. 12). "However, in consequence, each new script represented language in terms that were more remote from

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meaning than the units of the preceding script, thus posing new problems for learning and deciphering" (Barnhart, 1991, p. 12).

Educators involved in the technological developments of the 20th Century have grappled with the problems for learning and deciphering posed by the print-based culture, and have posed solutions related to multi-sensory, multi-dimensional modes of communication. Multi-sensory instructional theory and practice, as we know it, originated with Comenius' *Orbis Sensualium Pictus* (Weber, 1930, p. 27). Comenius popularized illustrated textbooks or visual aids that served to associate "objective reality, or its pictorial representation, with abstract cognate word symbols" (Saettler, 1990, p. 31). Comenius also developed a theory of instruction that deals with every phase of instruction which Pestalozzi later implemented as principles of instruction based on "the laws of natural human development" (Saettler, 1990, p. 36).

Weber, another pioneer in the realm of multi-sensory communication, divided visual experience into two classes, real and vicarious. "Real experience arises from a conscious response to an actual problematic situation . . . vicarious experience, by way or difference, arises from a response to an unreal, or make-believe situation, which is represented to us by change, gesture, word, line, form, or arrangement" (Weber, 1930, p. 1). Weber (1930) asserts that viewing a motion picture provides vicarious experience at its fullest. Through this century, the need for vicarious experience in human communication has grown along with an increasingly complex merging of diverse cultures brought together by telecommunication technologies.

Although print-based human communication is the dominant mode of communication in western civilization, it deprives learners of the essential basal experiences that allow for an accurate translation of word symbols, resulting in a potential mismatch between mental images and word associations (Berger, 1987; Gumpert & Cathcart, 1985; Kellner, 1988; Weber, 1930). McClusky (1949) discussed this phenomena nearly a half-century ago, stating: "Studies of language development show that elementary word and number meanings arise out of sensory experience with objects and things, but later words and numbers are used in a manner which removes them from the concrete. Hence, words and numbers may become highly abstract and complex in use and in meaning. In fact, they may be "abstracted" to the point of being meaningless. Therein lies the disease, known as verbalism, which plagues instruction" (p. 1). Researchers and educators throughout the 20th Century have grappled with the problems posed by alphabetic systems dominating human communications since the development of the printing press. Given Barnhart's (1991) premise that human communication systems undergo an evolutionary process, I suggest here that microcomputer technology is facilitating yet another evolutionary step in human communication which defines and embodies a new form of literacy.

Many agree that literacy is above all culturally bound by the social contexts and customs surrounding the communication act. Putting it best, Boyer (1987) states that "true language literacy is achieved only through *cultural literacy*" (p. 81). The term cultural literacy, initially an American phenomenon, refers to one's ability to understand an area of knowledge (Barton, 1994, p. 13). "The equivalence between text and knowledge is one of the great unacknowledged assumptions of education in the past few centuries" (McCorduck, 1992, p. 245). In today's computer-networked society, cultural literacy reaches beyond the tradition of print literacy to include visual, media, and computer literacy as well (Considine, 1987; Feinstein, 1993; Griest, 1992; Kellner, 1988).

Fundamentals of Electronic Literacy

Hypermedia technology, with its rapid innovations capable of processing multiple modes of communication, challenges

commonly held assumptions about the nature of literacy. It is increasingly apparent that interactive hypermedia is the up and coming mode of communication for the 21st Century (Considine, 1987; Galbreath, 1994; Kalmback, 1994; Kellner, 1988; Popkewitz & Shutkin, 1993; Shirk, 1991). In early predictions, the hypermedia industry was expected to grow rapidly from $3 billion in 1991 (U.S. and Canadian markets) to estimates from $13+ to $31+ billion by 1995 and estimates ranging from $34+ to $81+ billion by the year 2000 (Brandt, 1992). Although print-based texts continue to dominate communication in education, static print-based linear text no longer dominates American cultural communication: "Sixty-five percent of information imparted between people is nonverbal in our culture" (Considine, 1987, p. 634). Some claim that the emergence of multi-sensory, multi-linear communication is so profound that it indicates a new, postmodern era in history (Griest, 1992; Kellner, 1988; Landow, 1992; Faigley, 1992). Electronic forms of communication spurred on by advances in hypermedia and computer network technology embody important cultural changes influencing the nature of literacy itself.

Electronic communication not only includes printed text but may also encompasses pictorials, film grammars, and multi-sensory structures requiring semiological analysis. Some use the term "media literacy" to refer to the new forms of electronic communication. The objective of media literacy instruction involves students in "learning the skills of deconstruction, of how cultural texts [media] work, how they signify and produce meaning, and how they influence and shape their 'readers'" (Kellner, 1988, p. 47). Gambell (1989) identifies the mental operations characteristic of literacy as the ability to crack a code, to derive information from the code, to derive meaning from the information, to act on such meaning, and to make inferential and other cognitive structures from the meaning to arrive at new meanings (p. 273). Given these characteristics, the definition of literacy is no longer bound by print, but may include the full range of multi-sensory information found in hypermedia communication systems.

Characteristics of Hypermedia

Essential to understanding any hypermedia communication system is an understanding of hypertext. Hypertext "consists of a network, or web, or multiply connected text segments. Hypertext writers set up multiple connections between nodes of a text, and readers choose which links to follow, which nodes to read, and which nodes to skip" (Johnson-Eilola, 1994, p. 197). Conceptually, hypertext can be used for several communication purposes. One purpose is to facilitate locating information. The search engine capability of the computer allows one to type in a key word or words and to search a single text for all references to the word in context. The user of computer networks such as the World Wide Web may employ a "key word" search strategy to locate information in individual texts stored within the network's databases. Another use of key words are preprogrammed hyperlinks created by a hypertext author. Preprogrammed hyperlinks are created with hypertext mark-up language (html). The hypertext author utilizes html to establish connections between electronic files which may contain printed text, or audio, video, and pictorial stills and animations.

There are fundamental differences, however, between types of hyperlinks. Links that are created through key word searches reflect print-based activities engaged in by readers of cross-references such as encyclopedias, dictionaries, technical manuals, citations, and footnotes (Johnson-Eilola, 1994, p. 201). Links created by authors and embedded within documents represent an innovation in communication much different than the linear, transition-laden narratives of print. The hypertext author may create a variety of hyperlinks representing a multitude of rhetorical strategies involving key words, their synonyms, antonyms, analogies, comparisons, contrasts, associations, etc. The hypertext author may draw on known rhetorical

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strategies employed by print-based linear writers, or may invent new strategies for linking nodes of multi-sensory information.

Hypertext, indeed, represents a new medium for thought and expression (Bolter, 1992; Eldred & Fortune, 1992; Nelson, 1992; Shirk, 1991). The process of reading in hypertext conversely becomes an interactive process of constructing meaning in that the reader has choices to make about which hyperlinks to pursue. In addition, the hypertext reader not only can rely on a linear narrative flow laden with transitionary statements which explain the connections between sentences and paragraphs. In hypertext, the hyperlink is the transition and comes color-coded without an explicit explanation as to where it may lead. While the process of meaning making is nothing new to literate readers, the multiplicity of choices facing a hypertext reader calls for new skills related to drawing inferences, and some yet unknown reading strategies. Paths in hypertext are characterized by multi-linear, subordinated, cyclic, and associative thinking patterns that form the basis for new grammars and structures of communication in electronic environments (Bolter, 1992; Ulmer, 1992).

With the rapid advances in computer technologies capable of processing not only large amounts of print-based texts, but audio, visual, and film texts as well, hypertexts are often embedded within hypermedia communication systems. Hypermedia is characterized by nonlinear hyperlinks within a multimedia environment (Lockard, Abrams & Many, 1994, p. 219). In other words, hypermedia's fundamental operating principles derive from hypertext. Hyperlinks, in a hypermedia communication environment, relate printed text to audio text, or visual displays, or film clips. While hypertext draws on the standard grammar of its verbal language origin, hypermedia draws on lesser known grammars from 20th Century fields of communication including cinematology, visual literacy, and semiotics. Here again, in new combinations, the grammar of hypermedia is little known. We need to take a close, analytical look at emerging grammars from new types of electronic communication systems in order to begin to understand the evolutionary literacy of the coming age.

An underlying premise of visual instruction is that all visuals are arbitrary to some degree, requiring acquired skill to compose and comprehend. Current objectives for visual literacy instruction regard teaching the learner how to comprehend both literal and metaphoric meanings of visuals through descriptive reflection, composition analysis, context analysis, and evaluation of images (Considine, 1987; Feinstein, 1993). New literacy codes are also manifest in media grammars or structures. Film grammars include the close-up shot, medium shot, long shot, full camera shot, and tracking shots (Berger, 1987; Considine, 1987; Fehlman, 1992). Camera distance indicates or signifies meaning. For example, close-up shots signify intimacy; in contrast, full shots signify social relationship (Berger, 1987, p. 152).

Audio codes, though hardly mentioned in the literature about literacy, include oral narration, dialogue, music, environmental sounds, and quiet pauses (Fehlman, 1992). The comprehension of multi-sensory codes constitutes the substance of media literacy efforts aimed at enhancing one's ability "to intuit or predict the next sequence [which] makes communication possible" (Gumpert & Cathcart, 1985, p. 28). Such intuition or prediction relies on familiarity with the cultural codes the composer employs to connote meaning within the media. Of concern to educators should be the gap that exists between the institutionalized codes of traditional, print-based curriculum and codes encountered daily by students living in a computer-networked society: "Just as people learn to speak and to think in the grammar of the media first acquired, they take for granted a world view which rests upon a reality structured through available communication technology" (Gumpert & Cathcart, 1985, p. 30).

Hypermedia carries complex messages embedded in a multi-sensory, interactive medium, making plausible the notion of a new literacy. The trend toward hypermedia as a mode of communication in mainstream American culture indicates a need for educators, who shoulder much responsible for the literacy of youth, to look beyond print-based notions of literacy to an emerging cultural literacy driven by and embodied in electronic hypermedia communication systems.

Emerging hypermedia technology particularly challenges the assumption that the printed word is the best communication medium for educational purposes. Changes in cultural communication need to be reflected in the classroom. "One of the greatest areas of deficiency is the failure of the school system to provide young people with an understanding of the form and content of the communication technology of their society" (Considine, 1987, p. 639). Hypermedia may soon constitute the student's *first language*. With this in mind, I have attempted to outline a historical rationale for redefining what it means to be literate in the age of electronic communications.

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